ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 147-148.] MARCH and APRIL. [1899.

DCXXXIX.—PLANT DISEASES—I. TREE ROOT-ROT.

(*Agaricus* [Armillaria] *melleus*, Vahl.)

(With Plate.)

Notwithstanding the existence of numerous excellent treatises and handbooks on the diseases of plants produced by parasitic fungi, there appears to be still a need of descriptions of the more common ones in moderately popular language, accompanied by characteristic portraits of the organisms and of the mischief they effect. Some semi-official correspondence has taken place between Kew and the Board of Agriculture on the subject. It has been decided, therefore, to publish a series of articles in this form from time to time in the *Kew Bulletin*. They may possibly be collected eventually into a volume, which will be sold separately.

Agaricus melleus is one of the most generally distributed and destructive of "toadstools," attacking all kinds of fruit trees, many broad-leaved forest trees, also all European and many imported conifers. Hartig records having recognised its mycelium in fossil wood of *Cupressinoxylon*. As a saprophyte it occurs in dense clusters at the base of stumps, and also on posts and worked timber.

The cap or pileus is 2 to 3 inches across when expanded, pale honey-colour, and ornamented with numerous minute scales; stem 4 to 6 inches long, coloured like the pileus; gills white, with just a suspicion of pink, and, when young, hidden by a membrane stretching from the stem to the edge of the pileus. As the latter expands this membrane breaks away from the edge of the pileus and forms a ring or collar round the stem. The spores are white, and settle on objects under the gills in the form of a dense white powder.

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The fruit of the fungus is usually not formed until the tree has been killed, or nearly so, by its mycelium; nevertheless, the disease is indicated by the pale colour of the leaves and the stunted branches, and, in the case of conifers, by the great accumulation of extruded resin round the collar.

The spores of the fungus dispersed by wind and carried by the fur of animals, &c., germinate and first form a delicate, white cobweb-like mycelium, which soon produces blackish, cord-like, radiating strands of mycelium called *rhizomorphs*. These bodies, which vary in thickness from that of thick thread to moderately thick twine, continue to increase in length, travelling a few inches underground, until they come in contact with the root of a tree, when the cortex is pierced and a firm white sheet of mycelium is formed between the cortex and the wood. This felt gradually passes up the trunk for some distance between the bark of the wood, and also extends into other sound roots. At the same time the rhizomorphs continue to spread over the surface of the roots and the collar, entering the cortex at various points. Delicate strands of mycelium extend from the felt formed under the cortex into the wood, principally along the medullary rays, and thence pass into the vessels, which soon become choked with a dense mass of mycelium.

In conifers the mycelium fills the resin-canals and destroys the cells forming their walls, the resin exuding through the bark in large quantities and collecting round the collar; hence the name "resin-flux" sometimes given to this disease.

At a later stage of the disease the surface of the roots and collar are covered with a white felt of mycelium, which exhibits a pale phosphorescent light in the dark.

After the death of the tree, numerous stout, branching, black rhizomorphs form a network between the wood and the bark.

Finally, after a tree has been attacked and the mycelium of the fungus well developed, numerous rhizomorphs spread underground, where they continue to extend until they come in contact with the roots of some neighbouring tree, which is attacked and killed, forming in turn the starting point from which rhizomorphs again wander in search of other victims.

Preventive Measures.—There are two methods by which a tree may become infected:—(1) spores; (2) underground rhizomorphs. Infection by means of spores may be prevented by destroying all fungi growing in the neighbourhood of valuable trees. The fungi should be collected and burned; kicking over and trampling under foot simply disperses the spores and does more harm than good.

If a tree is suspected of being diseased, this can soon be ascertained to a certainty by exposing the base of the trunk and a root; the presence or absence of white mycelium under the cortex will decide the question. If other trees grow in the vicinity of a diseased tree, the latter should be isolated by means of a narrow trench about 9 inches deep, made at a distance of 3 or 4 yards from the trunk of the diseased tree, for the purpose of intercepting the progress of underground rhizomorphs. The soil removed in digging should be thrown inside the trench.

G. Massee.

Description of Figures.—Fig. 1, a cluster of *Agaricus* (Armillaria) *melleus*, Vahl, nat. size; 2, section of a fungus, showing the gills running for some distance down the stem (decurrent) and producing at the base of the stem black cord-like strands of mycelium or rhizomorphs; nat. size.

DCXL.—ARTIFICIAL PRODUCTION OF INDIA-RUBBER.

India-rubber, or caoutchouc, is chemically a hydrocarbon. But what is called its molecular constitution is unknown. All that has been ascertained is that when decomposed by heat (distillation in closed vessels) it is broken up into simpler hydrocarbons, amongst which is isoprene.

Caoutchouc is found in a considerable number of plants in no way related by botanical affinity. But they are for the most part natives of tropical countries. As is well known, it occurs in the *latex*, a milky juice contained in the laticiferous vessels. It is not dissolved in the latex but is merely suspended in it.

All chemical substances of vegetable origin sooner or later yield to the art of the synthetic chemist, and admit, therefore, of being built up from simpler compounds. The methods of accomplishing this in individual cases may or may not lead to commercial results. In many cases they remain merely of theoretical interest as, though practicable, they are too cumbrous and expensive to be of actual utility.

The artificial production of every organic compound is, then, a scientific problem which may have commercial results. It is always a matter of interest to note and place on record the first step towards its solution, although the commercial application may be remote.

Such a first step has been achieved by Dr. Tilden, F.R.S., Professor of Chemistry in the Royal College of Science, South Kensington, in the case of india-rubber. He has kindly permitted the republication of his results in these pages with some more recent revisions. They have also been republished in the *Chemical News*.

"*Note on the Spontaneous Conversion of Isoprene into Caoutchouc.*

"[Read before the Birmingham Philosophical Society, May 18th, 1892.]

"Isoprene is a hydrocarbon which was discovered by Greville Williams many years ago among the products of the destructive distillation of india-rubber. Later, in 1884 (*Trans. Chem. Soc.*, vol. 45, p. 410), it was observed by myself among the more volatile compounds obtained by the action of a moderate heat upon oil of turpentine and other terpenes. It is a very volatile

liquid, boiling at about 36°. Its molecular formula is $C_5 H_8$, and it forms a tetrabromide, $C_5 H_8 Br_4$, but no metallic derivatives like the two homologues of acetylene.

"Bouchardat (*Compt. rend.* vol. 87, p. 654, and vol. 89, pp. 361 and 1117) observed that when isoprene is heated to a temperature near 300°, it gradually polymerises into a terpene, which he called diisoprene, but which is now called dipentene. This compound boils at 176°. A quantity of colophene, similar to that which is produced by the action of heat upon turpentine, is formed at the same time. When isoprene is brought into contact with strong acids, aqueous hydrochloric acid for example, a small portion of it is converted into a tough elastic solid, which has been examined by G. Bouchardat and by myself. It appears to be true india-rubber.

"Specimens of isoprene were made from several terpenes in the course of my work on those compounds, and some of them I have preserved. I was surprised a few weeks ago at finding the contents of the bottles containing isoprene from turpentine entirely changed in appearance. In place of a limpid colourless liquid, the bottle contained a dense syrup in which was floating several large masses of a solid of a yellowish colour. Upon examination, this turned out to be india-rubber. The change of isoprene by spontaneous polymerisation has not, to my knowledge, been observed before. I can only account for it by the hypothesis that a small quantity of acetic or formic acid had been produced by the oxidising action of the air, and that the presence of this compound had been the means of transforming the rest. The liquid was acid to test paper, and yielded a small portion of unchanged isoprene.

"The artificial india-rubber, like natural rubber, appears to consist of two substances, one of which is more soluble in benzene or carbon bisulphide than the other.

"A solution of the artificial rubber in benzene leaves on evaporation a residue which agrees in all characters with a similar preparation from Para-rubber.

"The artificial rubber unites with sulphur in the same way as ordinary rubber, forming a tough elastic compound.

"The constitutional formula of isoprene is now known to be :— Methyl-crotonylene, $CH_2 = CCH_3 - CH = CH_2$.

"It is obvious that compounds such as these, containing doubly-linked carbon, may polymerise in a variety of ways ; and, in the present condition of our knowledge even of isoprene, it would be idle to speculate as to which out of the numerous possible arrangements would correspond to the constitution of caoutchouc."—(*Proc. Birm. Phil. Soc.* viii., Pt. I.)

In a recent letter Professor Tilden states :—"As you may imagine, I have tried everything I can think of as likely to promote this change, but without success. The polymerisation proceeds *very* slowly, occupying, according to my experience, several years, and all attempts to hurry it result in the production not of rubber but of 'colophene,' a thick sticky oil quite useless for all the purposes to which rubber is applied."

DCXLI.—LAGOS RUBBER INDUSTRY.

In the *Kew Bulletin* for 1895 (pp. 241–247) an account is given of the important commerce which had resulted in Lagos from the collection of rubber from the Ire tree (*Kickxia africana*). It is, however, to be feared that this source of wealth to the Colony will be short-lived, owing to the reckless way in which the rubber trees had been exhausted by the rubber collectors.

The reports given in the following correspondence depict a state of things which, unless arrested by some remedial measures, can only lead to the extinction of the industry. These reports are highly creditable to the two young Africans, Messrs. Leigh and Dawodu, by whom they were drawn up. As stated in the *Kew Bulletin* (1893, p. 365), they have had the advantage of training in the Botanical Department of Jamaica and subsequently at Kew.

The Ire tree, or, as it is locally called, the "female Ire tree," is *Kickxia africana*, an Apocynaceous tree. The "male Ire tree" appears to be *Holarrhena africana*, also Apocynaceous. In the *Kew Bulletin* for 1895 (p. 245) it is described by an oversight as Rubiaceous. It yields rubber oil apparently of little commercial value.

The *Ficus* referred to in the reports is probably *Ficus Vogelii*, discussed in the *Kew Bulletin* for 1888 (pp. 253–261) and 1890 (pp. 89–93), the extraction of rubber from which appears to have met with little success. It was first indicated as a source of rubber in the *Kew Report* for 1878, p. 39.

Governor McCallum to Mr. Chamberlain.

Government House,
Lagos, 24th June, 1897.

Sir,

In despatch "Interior," dated 9th February, 1897, paragraphs 5 and 6, Captain Denton referred to the wholesale destruction of rubber trees in the Hinterland, and the consequent injury to a most important industry of the Colony. He reported that he had sent Messrs. Leigh and Dawodu of the Botanical Department to Ibadan, with a view to the protection of this industry, and he recommended the establishment of a small Forest Department.

2. I have now the honour of forwarding copy of report received from Messrs. Leigh and Dawodu, from which you will observe that Captain Denton's fears have been more than realised, and that the destruction is very widespread, extending to the Ekiti-Parapo Confederacy as well as to Ibadan and Jebu. I also enclose return for the last six months from the Acting Collector of Customs, showing that there is a falling off in export of rubber amounting to 33 per cent. compared with 1896.

3. This falling off is serious, for—*cæteris paribus*—it means a corresponding diminution of imports, and therefore of revenue. I do not, however, anticipate any serious reduction of revenue, for, from other causes, the total amount which has been collected for five months is not below that estimated.

4. I, moreover, entertain hopes that the present visit, for the first time in history, of kings and chiefs of the Hinterland, with their numerous followers, will be of the greatest benefit to the Colony, and be the means of securing a marked increase of trade with the interior.

5. It is important, however, to take steps which will protect the forests from being ruthlessly destroyed, and which will allow young rubber trees to mature before they are tapped by irresponsible collectors. I therefore cordially endorse Captain Denton's recommendation as to the necessity of a Forest Department.

* * * * *

7. I hope also to organise some system by which the native chiefs will exercise more control over the collectors, but this I can scarcely do until I visit the country myself, and see what promises to be the best means of securing permanence of supply.

8. In the meanwhile, I have thought it desirable to give you some idea as to how the question stands, for you will probably have its importance represented to you by the merchants of Liverpool and Manchester, who will suffer from the falling off in the supply of rubber which has taken place during the current year.

9. Had the collection been entrusted to the chiefs of Yoruba and their men, it is probable that our controlling influence would have checked the destruction which has taken place, but Fantees from the Gold Coast have not had permanency of supply in their minds when they have destroyed trees in all directions, and imperilled the constant supply of a material for which there is now so much demand.

I have, &c.,

(Signed) HENRY MCCALLUM,
Governor.

The Right Honourable
Joseph Chamberlain, M.P.,
Secretary of State for the Colonies.

[Enclosure.]

SIR, Ife, May 25th, 1897.

WE beg respectfully to report to you our work and progress since we left Ibadan.

We should state that before leaving Ibadan we had an interview with His Excellency the Acting Governor.

In this interview we informed His Excellency of the ruined state and condition of the Jebu and Ibadan forests which we had then just visited ; and also conveyed to him the information we had gathered from those interested in the industry to the effect that there was no rubber forest in the neighbourhood of these two countries that has not been spoiled by overworking.

We were then instructed by His Excellency to go to the Ekiti country, where, we told him, as we were informed ourselves, rubber working was going on then. Accordingly we left Ibadan on the 21st of March for the Ekiti countries, and went as far as Owo, which town, we understand, is the limit of the Protectorate of the Lagos Colony on that side.

But we regret to say that all the rubber forests through which we have passed and visited during the whole tour have all been spoilt by over-tapping ; consequently, we thought it our best plan to make it understood to the kings and chiefs of the different towns we visited, that it is the wish of His Excellency the Governor to improve the quality of the rubber, and to make the industry a permanent one : that His Excellency desires this, not only in the interest of trade, but also for the lasting benefit of themselves and children ; and that for this purpose we had been sent out by the Government. In order to effect the wish of His Excellency, four important things were impressed on their minds :—

1. Considering the present state of the forests, we strongly advised them to leave off tapping for two years, when all the trees in their forests which have been almost stripped of their barks shall have healed up, and be in a fit state for extracting fresh supply of juice.

2. That after the trees shall have healed up the process of tapping should only have one season in a year, and this should be during the rainy season. We explained that by so doing the trees would be allowed ample time to heal up and thus be in a good state for the next year's tapping.

3. That in tapping the trees the rubber collector should be very particular in making his lateral incisions ; these should be 2 feet apart. This we explained is very important as on it depends the life of the trees.

4. In places where juice is available we have seized the opportunity of teaching those who are interested in this industry the proper mode of preparing rubber.

Our present plan is to go round to the Yoruba forests to teach these facts as has been done in the other districts.

We are, &c.,

(Signed) F. G. R. LEIGH and
T. B. DAWODU.

The Acting Resident,
Ibadan.

ACTING GOVERNOR CAPTAIN G. C. DENTON TO MR. CHAMBERLAIN.

Government House,
SIR, Lagos, 28th June, 1898.

I HAVE the honour to forward a report by Messrs. Leigh and Dawodu, Assistant Curators of the Botanic Station, giving the results of their mission to the interior upon which they were sent by me in February, 1897.

2. I still hold to the view I expressed in my despatch of the 9th February, 1897, on the subject of a Forestry Department, and I think that, though it may not be possible to put in force a drastic Forestry Ordinance, much may yet be done to preserve the rubber and other trees if the Goverment, acting through the authorities of the country, will take upon themselves the supervision of all the forests.

3. I beg to suggest that Messrs. Leigh and Dawodu's report be transmitted to the Director of the Royal Gardens, Kew.

I have, &c.,
(Signed) GEORGE C. DENTON,
Acting Governor.

The Right Honourable
Joseph Chamberlain, M.P.,
Secretary of State for the Colonies.

[Enclosure.]

Botanic Station, Ebute Meta,
SIR, July 28, 1897.

WE have the honour to submit for the information of His Excellency a general report of the work done during our absence in the interior.

Leaving Lagos on the 8th February we proceeded to Ibadan, *viâ* Epe, where we arrived on the 13th instant. Here we received definite instructions as to the exact nature of our mission.

During our stay at Ibadan, and before we received instructions to proceed further up country, we took the opportunity of visiting the Ibadan and Jebu forests, which are so rich in rubber and timber trees. We regretted to find that though both forests abound in Ire trees (rubber trees) the latter have all been over-tapped, and the forests have in consequence been ruined. Large numbers of trees have died from sheer exhaustion, and those that survived were in a very poor condition, and would take a couple of years to recover themselves.

As all rubber-working had practically ceased in the Ibadan and Jebu forests owing to the destruction of the trees, we were instructed by His Excellency to proceed further up country where rubber-working was still going on, and teach the people the best methods of working and preparing rubber, so that the trees may be preserved and the industry made a permanent one.

We accordingly left Ibadan on the 21st of March and proceeded first to the Ekiti countries, where we understood rubber-working was still going on. We found the forests of all these countries to abound, more or less, in Ire rubber trees; but we discovered that all rubber-working had practically ceased even in these far off countries, a consequence due entirely to the overworking of the trees.

As far as we could inspect them all the trees had been over-tapped, and consequently many of them were dying, as is the case with the Jebu and Ibadan forests.

We thought it therefore our best plan, seeing the condition of their forests, to call together the kings, chiefs, and townspeople of the different towns we visited, and conveyed to them the wishes of the Lagos Government with regard to the rubber industry.

We called their attention to the ruined condition of all the rubber trees in their forests, and pointed out to them the folly and short-sightedness of the system of "killing the goose for the golden eggs."

We made them to understand that it is the earnest wish of the Lagos Government to make the rubber industry permanent, and to improve the working of it; and that for this purpose we had been sent up to them, but that it is impossible for the industry to last another five years with the present system of working the trees, and that we would strongly advise them, therefore, in accordance with the wishes of the Government, to stop all rubber-working in their forests for the next two or three years, so that the surviving trees might have sufficient time to recover themselves with bark, and to allow young ones (in which their forests abound) to attain tapable sizes. After this period of time every proprietor should then begin to work his bush on quite a different system. That in this way the industry would be permanent, and they would derive yearly income from their forests.

We pointed out to them the great commercial value of this tree, and its financial superiority over cola and palm trees, and therefore strongly urged them to devote as much, if not greater attention to the rearing and cultivation of this tree as they do to the latter ones.

They were made to understand that by doing this they would not only be carrying out the wishes of the Lagos Government, which is a duty incumbent on them, but that they would also be promoting the interest of trade and be benefiting themselves and children.

Finally we told them that it is their duty to stop all intruders in their forests, as it was strangers who had ruined their forests more than the inhabitants themselves.

We regret to report that all over Yorubaland, beginning from Iwo, and as far as we went in this direction, the forests are sparse and there are more fields than anything else. Consequently there are few rubber trees in those parts, and a good deal of what there are are what the natives call the male Ire tree [*Holarrhena africana*]; it produces a similar juice to the female Ire tree, but this coagulates only to the consistency of the soft Ire rubber (*Landolphia* sp.; this deserves investigation as it is very plentiful in some parts and yields abundance of juice).

The only parts where good bits of forest were found were Osogbo, Ila-Oke, Ilobu, Ejigbo.

All over Yorubaland, therefore, we strongly urged the people to take to planting Ire trees, as they do kola and palm trees, where suitable lands are available, explaining how they should be planted, and what a great source of income such an undertaking will be to them in the future. We are pleased to report that the people seemed to fall in readily with this suggestion.

We furthermore impressed on them that the process of tapping should only be done once a year, and during the rainy season, so that sufficient time be allowed the trees to rebark themselves against the next season.

We explained to them the advisability of their allowing fully 2 feet between the oblique lateral grooves: this is just the point where the native tappers destroy the trees; they do not allow more than from 6 to 9 inches between the lateral grooves, thus

leaving a very limited amount of bark between the grooves, subsequently the trees all wither (especially during the dry season) and die.

The mode adopted by the Fantees, who are to be found in good numbers at Owo and its vicinity, for extracting the juice is the one most suitable and convenient. The first point is for the tapper to make a vertical groove ($\frac{1}{2}$ to $\frac{5}{8}$ in. wide) from the bottom to the top of the tree, and in such a way as to gouge out a bit of the true bark; after this is done, and as the tapper is descending, two series of oblique lateral grooves converging towards the main vertical groove are made, of the same width; thus all the exudation of the lateral grooves flows into the main groove which, together with its own exudation, finds its way down to the base of the tree where a receptacle of some kind is placed to receive the milk.

The method the natives adopt for coagulating the juice is a very dirty and improper one, but a better and simpler way of producing a whiter and superior quality was shown them. This is done by adding twice the quantity of water as there is juice (strained), and then gradually heating; by so doing the rubber becomes coagulated, and does not burn up as in the case with the native system. This kind of rubber comes out milky white, and when pressed (to get rid of water), has an agreeable smell and a superior quality. We pointed out to them the advantage gained in taking a little trouble in the preparation, as on it depends the value of their produce.

As there was no more rubber milk to be obtained in several towns (save few) through which we passed, we were obliged to give oral lessons to those interested in this industry. The Ire tree (*Kickxia africana*) is the only tree from which our present rubber supply is obtained, although in some parts about the Ekiti forests we observed other rubber-yielding trees, such as species of *Landolphia*, *Ficus*, &c.

The species of *Landolphia* yielding the soft rubber is found plentifully in the Ekiti forests, but owing to its softness, and the low prices offered by merchants, the people do not consider it remunerative enough.

The other species of *Landolphia* (probably *L. owariensis*) which produces the harder and superior rubber is much preferred, but as it is very scarce and not so common in the interior as the soft one, very few balls have been brought down and sold at very lucrative prices. During all our tour the only place where it was observed to exist (but not in a very large quantity) is in the Isoya forests. We advised them to search for this particular species, which is commonly known under the native name of Ibo Akitipa, and to collect rubber of it, which, we assured them, will be readily sold at as good a price, if not better, than that offered for the Ire rubber. The tapping of this species of *Landolphia* will not take so much time as the Ire. The operation is simple enough, and can be successfully done by intelligent and careful natives. The stem of the vine (which is as thick as a man's arm) is detached from all its supports and stretched out on the ground, but its roots are not at all disturbed, so that the vine is still supported by its roots. After stretching out the vine on the

ground, incisions of 6 in. × 2 in. are made at distances of from 6 to 8 ft. apart, under these incisions vessels are placed to receive the milk, which easily and readily coagulates, and is then balled or wound up. This kind of rubber has no water whatever in it.

The species of *Ficus* noticed are several, but owing to the insignificance and inferiority of its rubber (specimens have been sent to England and valued at a very low price) we did not recommend these to them.

On the whole we are compelled to say that the Government was rather too late in taking up this matter, and that unless our suggestions and recommendations are followed by the people we very much fear for the permanency of the rubber industry.

Rubber collectors have now to go 15 or 16 days off Ibadan for rubber beyond the Protectorate of this Colony. The countries where active rubber-working is going on are the Benin and Akoko forests. Unfortunately we could not proceed to these parts which, we understand, are outside the Protectorate of this Colony, consequently we did not go further than Owo (a place only three days off Benin) which, we understood, is the limit of our Protectorate on that side.

* * * *

We have, &c.,
(Signed) F. G. R. Leigh,
T. B. Dawodu,
Assistant Curators.

Extract from Lagos Annual Report for 1897.

"As was anticipated, the falling off in the production of rubber, due to the reckless way in which it was collected, has come to pass, the amount shipped in 1897 being 4,458,327 lbs. as against 6,484,365 lbs. in 1896. It is early to talk pessimistically of the 'extinction of the industry,' inasmuch as the opening up of fresh country to peaceful commerce cannot fail to revive the production. At the same time the greed and guile of the small minority that collects and adulterates rubber, coupled with the apathy of the large majority that only looks on, must inevitably deal a severe blow to the trade. Steps are, however, being taken to encourage the native chiefs to have the rubber collected in a thrifty and systematic manner, which, it is hoped, will show good results in the near future" (pp. 6, 7).

DCXLII.—MADAGASCAR INDIA-RUBBER.

Enquiries are frequently made about the rubber-producing plants of Madagascar. This island has long been known to furnish a supply of india-rubber to commerce. (See *Kew Bulletin*, 1892, p. 70.) Hitherto it has been supposed to be yielded exclusively by species of *Landolphia*, the "rubber-vines" which are so widely distributed in Tropical Africa. Within the last few years it has been obtained, and apparently in abundance, from a number of other plants.

About 1892 an immense development of the rubber-trade took place in Southern Madagascar. The following account is borrowed from the *India-rubber and Gutta Percha and Electrical Trades Journal* (Nov. 3, 1893, p. 107) :—

The French Vice-Resident, writing from Nossi Vé (not to be confounded with Nossi Bé)—his report appearing in the *Moniteur Officiel du Commerce* of November 2nd—says :—" Caoutchouc has only been exploited in the southern regions since the first months of 1892, and the first operations, conducted with discretion, have given very brilliant profits ; since then the affair has been blazed abroad ; a veritable caoutchouc fever has raged with everyone, especially the natives. Everything has been neglected for the rich product, leading to great modifications in wages, in the recruitment of workers, and in the prices of food and goods, &c. But the exploitation of caoutchouc has been carried out with veritable vandalism ; the trees and shrubs producing it have been savagely destroyed : hence the diminution in the yield, as well as in the quality, because the natives have mixed other substances with the caoutchouc to increase the size and weight of the balls."

Some further information which has attracted a good deal of attention appeared in a letter from Mr. Abraham Kingdon which appeared in the *Standard* of Dec. 22, 1896.

I call your attention to the arid district of St. Mary's, the southernmost part of Madagascar, from which district an enormous amount of india-rubber has been procured during the last few years.

The india-rubber is procured from an almost leafless shrub with a large bulbous root. The discovery that this shrub produced india-rubber was made by a "fluke." Up to the time of the discovery, india-rubber had only been procured from *Landolphia*, which grows freely in all the low-lying parts of Madagascar, north of the arid district of St. Mary's. One day, however, a young native (who did not believe that india-rubber could be procured from anything but the *Landolphia*) brought two balls of india-rubber to Mr. Marchal, of Fort Dauphin. He said, "I have brought you two balls of something which looks like india-rubber ; but I do not think it can be india-rubber, because it was not procured from the vahy *(Landolphia)* ; but if you will buy some of it I will bring it to you." He added, "I saw some boys playing with these balls. They were made from the juice of a shrub, which coagulates as soon as it is exposed to the air."

Mr. Marchal said that he was not a chemist, and as he did not know whether it would turn out right in the process of manufacture he did not care to risk much. The natives offered to sell at five dollars (one pound) per hundred lbs., and Mr. Marchal accepted the offer. The rubber was brought in such large quantities that Mr. Marchal was very soon cleared out of goods and cash, but as he had been twenty-five years a resident of Fort Dauphin, and was trusted, the natives brought him large quantities on credit. He was able to load a small barque, and took the cargo to Mauritius, where he sold his india-rubber at twenty dollars (four pounds) per hundred lbs. For about eleven months Mr. Marchal had a monopoly, and during this period he cleared

twenty-six thousand pounds net profit. The same kind of india-rubber is now sold at Fort Dauphin at forty-five and fifty dollars per hundred lbs. Unfortunately the natives destroy the shrub in the operation of collecting the india-rubber; for, in order to take the milk from the bulb, they root up the shrub.

For the most recent information Kew is indebted to the following communication from the Foreign Office :—

FOREIGN OFFICE TO ROYAL GARDENS, KEW.

SIR, Foreign Office, September 3, 1898.

I AM directed by the Secretary of State for Foreign Affairs to transmit to you the accompanying copy of an article extracted from the *Dépêche Coloniale* respecting the cultivation of India-rubber in Madagascar.

I am, &c.,

The Director, (Signed) F. H. VILLIERS.
Royal Gardens, Kew.

EXTRACT from the *Dépêche Coloniale*, August 28, 1898.

The Exploitation of India-rubber in Madagascar.

The localities favourable for the cultivation of india-rubber in Madagascar are numerous, especially on the coast and lower levels of the Island.

It may be expected that the efforts which may be made in this direction will fully succeed if, in establishing plantations, the essential conditions for producing the best india-rubbers are properly studied. The best known rubber-trees are : the *Hevea*, *Manihot*, *Castilloa*, *Landolphia*, *Willughbeia* and *Ficus*.

Besides the vines (*Landolphia*) and the Euphorbiaceæ of the south, there exists a tree met with on the east side of the Island which the natives designate *barabanja*. This tree, which furnishes an abundant and much-prized latex, appears destined to play an important role in the future. There are two varieties, the one, the most important, with large leaves, the other with small leaves. They belong to the family of the Apocynaceæ, tribe Alstonieæ.

The *barabanja* is abundant in the region comprised between Vohemar and the Bay of Antongil. The tree is found wild up to an altitude of 1,300 to 1,600 feet. It prefers the glades and borders of forests, and may attain to a height of 50 feet, with a circumference of 5 feet. Specimens of this size are, however, rare, for, about the age of eight or twelve years, the natives make excessive incisions, and very often even cut down the tree in order to gather the latex.

The tree propagates itself readily from suckers, and it is to this that the present abundance of the tree is due. Very fine specimens are reported from the neighbourhood of Antalaha, Sahambava and Soavinandriana.

The cultivation of india-rubber trees has already been tried in different parts of the Colony. The preference seems to have been given to plants of *Hevea*, from Para, which appears likely to give satisfactory results.

With regard to the production of india-rubber, certain regions of Madagascar have been specially favoured. In the province of Fort Dauphin, for example, where an increasing production has been most observed, there were only 12 to 15 tons a year of rubber taken up to 1890 from *Landolphia* vines (Vahea) and from species of *Ficus*. But the discovery of the Euphorbiaceous plant, commonly called "*intisy*," which gives a superior latex, has stimulated an important commercial movement towards this district; the harvest has been collected more energetically, and this has resulted in the zone of the rubber production being reduced to a considerable extent.

For the last few months natives of the west of the province of Fort Dauphin have begun to bring a little rubber to the coast; but a European could not at present devote himself to regularly and systematically working the substance owing to the bad state of communication in the interior of the country.

During the journey from the forest to Fort Dauphin, the caoutchouc carried on the back, in loads of 65 lbs., loses from the heat of the sun a certain part of its weight. At the present moment, the production, together with the loss and cost of transport, comes to 1·05 fcs. per lb. If to this we add the expenses of packing, carriage to the sea, shipping charges, export dues at 0·10 fcs. per lb., the total price per lb. reaches 1·25 fcs. delivered on board the vessel in the Fort Dauphin Road. From Fort Dauphin Harbour alone there were exported in—

1896	...	...	...	167,857 kilos.	(369,285 lbs.)
1897	...	...	...	64,222 „	(141,288 „)

In the province of Majunga, the india rubber is one of the articles of export which occupy the largest place in the local commerce, and its importance increases each day. The rubber at Majunga comes from Morarano for the most part, from the bay of Mahajamba, from Namakia, Soalala, Marambitsy, and especially Maintirano and Morondava. Generally the rubbers from the west coast are produced from "vines," which the natives incise without any care, cutting even the roots in order to obtain the largest amount of sap. The most sought after is the "pink rubber," but one also finds the "*ambongo*," "*godroa*" and "*vea*." In the north the caoutchouc is generally prepared by the natives with sulphuric acid, lemon, salt, or juice of the tamarind; in the south, on the contrary, it is coagulated with salt only. The value of the latter in commerce is inferior to that of the north.

Rubber prepared with sulphuric acid is worth at the moment from 350 fcs. to 360 per 100 kilos. (220 lbs.), whilst other rubbers hardly fetch 300 fcs. per 100 kilos.

There were exported—

From Majunga, in 1896, 19,445 kilos.; in 1897, 41,448 kilos.
From Nossi Bé, in 1896, 11,340 kilos.; in 1897, 40,766 kilos.
From Nossi Vé, in 1896, 122,313 kilos.; in 1897, 122,129 kilos.

As soon as roads become more numerous in Madagascar, the colonists who wish to devote themselves to a rational cultivation and working of rubber will obtain good results; but they must act with judgment, and not take from the plant more latex than it can reasonably produce.

The botanical identity of the Madagascar rubber-yielding plants is obscure. It is much to be regretted that the French botanists do not investigate it and clear it up.

M. Henri Jumelle has devoted a chapter to the subject in his "*Les Plantes à Caoutchouc et à Gutta dans les Colonies Françaises*," pp. 104–116 (1898). Of the "vines" he states that the most valuable is the Vahy (*Landolphia madagascariensis*). Other forms of the native name are no doubt the Vahea and Vea mentioned above. It appears to yield "pink rubber."

Intisy is a small leafless Euphorbiaceous tree. It is certainly the shrub described by Mr. Kingdon. What he terms the "large bulbous root" is probably the fleshy stem.

Little appears to be known about the *barabanja* except that it is a tree of fifty feet in height. It may be conjectured that it is an undescribed *Tabernæmontana*.

The late M. Raoul sent to Kew a specimen of what he described as the "best rubber-yielding plant in South Madagascar," which appeared to be a new species of that genus, or possibly a *Mascarenhasia*.

The *Godroa* is a small tree, perhaps also Apocynaceous.

DCXLIII.—SKIRRET.

(*Sium Sisarum*, Linn.)

Enquiries have been addressed to Kew as to the cultivation in China and Japan, for the manufacture of sugar, of the skirret (*Sium Sisarum*).

The skirret, which was commonly grown as a vegetable in Europe in the sixteenth and seventeenth centuries, is now but rarely to be seen, the potato having in a very large measure replaced it, and contributed chiefly to its neglect. It is a member of the Natural Order *Umbelliferæ*. Each plant produces a number of esculent roots, like crooked and knotty fingers; these, as those of the related parsnip and carrot, possess a sweet taste, to which is added a slight flavour suggesting another allied plant, the celery.

Sugar, which gives this sweetness to the skirret, occurs in the roots of other species of *Sium*. *S. Ninsi*, a plant found in Japan, has sweet roots used medicinally, and the roots of *S. latifolium* of Europe and North America contain much sugar, here associated with a poisonous resin (see Porter in *Pharmaceutical Journal*, ser. 3, vii., p. 174).

The sweetness of the roots of *Sium Sisarum* has obtained for this plant a German name literally meaning "sugar-root," and suggested to Marggraf that sugar might be extracted from them.

Marggraf's name is well known in connection with the Beet-sugar industry, for his investigations, published in 1747 (*Histoire de l'Académie Royale des Sciences de Berlin*, 1747, p. 79), were the first to show that other plants besides the sugar-cane might profitably yield sugar. The white beet, the red beet and the skirret gave him in these first experiments "a sugar resembling

the best yellowish St. Thomas, known as Moscovade." He extracted sugar by two processes : the first consisted in drying the roots and powdering them, and then extracting with alcohol : by which method he obtained from ½ lb. of dried white beet 4 drachms of sugar, from the same weight of skirret 3 drachms, and from red beet 2½ drachms. Some sugar, he remarks, was lost. A second and cheaper process by expression was tried, and sugar such as described above produced ; after obtaining the sugar from the skirret roots he allowed the liquor left to ferment, getting an alcohol ; and by allowing the starch to settle he obtained a powder, such as was then used for powdering the hair.

Marggraf recognised that the white beet gave more sugar than tke skirret, but the skirret more than the red beet. From the parsnip and the wild carrot he failed to obtain sugar. When, in 1799, Achard, at the request of the Prussian Government, repeated Marggraf's work, it was with the white beet that he experimented, laying thereby the practical foundation of the modern industry.

Two analyses of skirret roots have been made. Parmentier (fide D'Orbigny, *Dictionnaire d'Histoire naturelle*, "*Sium*") obtained 8 per cent. of sugar ; Sacc (*Bulletin de la Société d'Acclimatation*, ii., 1855, p. 561) obtained 6·6 per cent. Sacc's analysis gave the following results :—

	In 100 parts.
Water	62·41
Fibre and Ash	7·91
Starch	18·09
Cane-sugar	6·60
Proteids	2·09
Soluble salts	1·37
Pectic acid	1·00
Gum	0·53

Sacc advocated the cultivation of the plant. He obtained roots weighing ½ lb. to 3¾ lbs., the average being a little below 1¾ lbs. As calculated (Dupuis, *Revue Horticole*, sér. iv., v., p. 305), this yield should give 76 tons to the acre ; but, as Sacc's plants were grown in very favourable conditions, such an amount is probably considerably above what may be expected.

The skirret is steadily going out of cultivation. In Great Britain, under the name of "crummock," it persisted in the extreme north of Scotland, after ceasing to be grown in England. In Scandinavia Schuebeler (*Die Pflanzenwelt Norwegens*, Christiania, 1873–5, p. 280) says that he had only seen it near Christiania, and that sparingly. In France, as Paillieux and Bois, authors of *Potager d'un curieux* tell us, in the north and about Paris skirret is only known as a name, and M. H. L. de Vilmorin writes that he is not aware that it is grown for market anywhere in France, but that it may be found in old-fashioned gardens, chiefly in the west and south of France from Tours to Nîmes and Avignon. In Germany and Austria it seems to be but little cultivated, the seed to maintain it in the few gardens, where it now exists, being, according to Herr Ludwig Möller, imported yearly from France.

Thus is the vegetable which in 1682 was said to be "the sweetest, whitest, and most pleasant of roots" (Worlidge, *Systema Horticulturæ*, p. 185) fast disappearing from gardens.

The history of its introduction into cultivation is very obscure. It is commonly stated that it came from China, but this is probably incorrect. No one except Loureiro pretends to have seen Chinese specimens, and there is reason to think that this botanist, when he stated that it was cultivated in Cochin-China and China, was in error. One botanist only, Thunberg, has obtained it in Japan, and then apparently as a cultivated plant. Maximowicz (*Mélanges biologiques*, ix., decas xiii., p. 17) accepts it as wild in the Altai Mountains and Northern Persia.

To Marco Polo has been attributed the credit of bringing it from Central Asia to Europe, but without sufficient evidence.

More recently Rostafinski (*Botanisches Centralblatt*, 25, p. 40) has given reason for thinking that, besides inhabiting Central Asia, it occurs wild in Podolia and Volhynia in S.W. Russia. From this region, he thinks, it was introduced into Germany by some embassy, as early almost as the Norman conquest of England. There is no great improbability about this. Certainly, of the names applied to it in various European languages, all, with two exceptions, appear akin to its German names, and may well be the result of carrying those names with it as it travelled from a German starting-point. This idea of a German centre of dispersal is very greatly supported by such statements as that of Olivier des Serres (1600), that the skirret came into France from Germany, and that of Simon Sirenius (1613), who, according to Rostafinski, says that it was introduced into Galicia from Maintz.

Summing up the evidence, which language affords, upon the migration of the skirret, we commence with an old German name "Gerle" or "Girel," used, according to Rostafinski, in 1160. This transferred to the French language has become "Girole," and by the addition of moren (Möhre = a carrot, *i.e.* esculent root) became "Gritzelmören" in Hesse, and "Kritzelmore" or "Krotzelmore" in other parts of the German Empire. Thence it is easy to trace the Polish "Krucmorka" or "Kucmerka," and the Russian "Kuczmerka." The Germans, however, originated, amongst others, a descriptive name, "Zuckerwurzel," and this gave rise, it seems, directly or indirectly to the Danish "Sokerot," the Dutch "Suikerwortel," and our English "Skirwort" or "Skirret"; and yet a second complication arose by the transference in France of "Chervis," from a native plant to the incoming Skirret. From this second French name would come the Spanish "Chirivia." Thus have we three sets of names; the first derived from Girel, and common to the Russian, Polish, German, and French languages; the second unmistakably of German origin, and common to the Anglo-Saxon races; the third apparently of French origin, and common to French and Spanish. Without dragging this form of evidence into too great prominence, we may still see in it some indication of the way in which the plant under discussion has wandered through Europe. The least widely spread names are likely to be the most modern, and the most obscure in meaning and cause of application the most ancient. And thus this points towards a German centre of dispersal.

Whether the French word "Berle" has any common origin with "Gerle" does not seem to have been discussed; nor has the origin of the Scotch word "Crummock" been clearly traced.

Some writers have thought with the early botanists, such as Fuchsius and Mattioli, that the Romans grew this plant. But if of Podolian and Asiatic origin, and introduced to Germany about 1100 A.D., then the "Siler" which served the Romans as a vegetable, and a superior form of which the Emperor Tiberius caused to be brought as an annual tribute from the Rhine (Pliny, *Historiæ Naturalis liber* xix., cap. 5), is not the skirret; and, indeed, the statement that the roots needed dishing up with honey to counteract their bitter taste almost proves this. Neither Columella's nor Pliny's plant appears to be *Sium Sisarum*.

England and France do not seem to have received the skirret until the sixteenth century, but once introduced into these countries it was for more than a century in considerable favour either fried or boiled, or as a salad with *Myrrhis odorata*. It also seems to have had a medicinal use, just as *Sium Ninsi* is said to have in the far East, as *S. nodiflorum* formerly had in the London Pharmacopœia, and as *S. latifolium* in France.

Linnaeus tells us how every German garden in his day contained it; but, as we have seen, this country, which appears to have distributed it to Western Europe, now hardly grows it.

DCXLIV.—CACAO IN ECUADOR.

Kew is indebted to a correspondent for the following interesting account of the production of Cacao in Ecuador. The particulars given with respect to Cacao blanco (*Theobroma bicolor*) are interesting, for though it has not found its way into commerce, the richness of the beans in fat may some day lead to their being turned to account. Trees have produced pods in the Botanic Gardens at Trinidad, and plants have been reared from the seeds

SÑR. J. V. SIGVALD MÜLLER to ROYAL GARDENS, KEW.

c/o Sucesores de Rafael Valdez,
Guayaquil, Ecuador,
September 17, 1898.

DEAR SIR,

By sample post I forward to-day beans of Cacao Machala (fine) and of Cacao blanco, which also comes from Machala on the coast south here.

1. Guayaquil will this year export above 3,500,000 lbs. of Cacao, which makes 200,000 bags.

2. All Cacao is divided here into "Arriba," which means "above" Guayaquil (Cacao that comes down the river, and which always is the best and most valuable) and into Cacao Balao and Machala, named after two ports along the coast south of the River Guayas (on which Guayaquil is placed).

3. To kill the seed (the peculiar Cacao flavour being at the same time developed) the beans are allowed to ferment. For "Arriba" this is done with great care, and sometimes three to four days are used in the process. But it is said that only one day is often used for the Cacao shipped from Balao and Machala. Anyhow, it is the

fermenting—which some German writer has called the rotting process—that kills the seeds and develops the colour which the nibs show when the seeds or beans are sliced lengthways. The colour should be chocolate brown and perfectly even. Badly fermented beans show the cotyledons greenish or bluish in part.

If the seeds are not fermented, they will sprout in the sacks and destroy everything. It seems that the southern growers only think about getting the vitality destroyed, while the "Arriba" planters take very great care while doing so.

4. The harvest is over with the end of July, but that is only the main crop. All the year round the gathering of the fruits goes on, but only the top price is locally attained for the main crop. Then "Arriba" is $2 to $3 above Balao and Machala, and not only $1 (equal 25d.), as now, between the three sorts. In September last Cacao Arriba stood at $29, Balao at $28, and Machala at $27 per arroba of 100 Spanish (equal 101½ English pounds about). (In this land of the metre, Spanish lbs. and English two-foot rules and Spanish leagues are really in use, the yard being "una rara.")

5. Just below the foot of the western slopes of the Western Cordilleras of Los Andes, the Cacao grows wild in dense bush. Monkeys are known to have enlarged such natural gathering grounds or formed new ones near them. The tree is inclined to grow with many stems, but to be productive the stems are here reduced to two or three. When planted they must have some shade trees or bananas among them, but otherwise they are left to themselves, except as to cutting out stems. In Trinidad (exporting about half against Ecuador) the trees are topped and kept low and wide apart.

6. There is no doubt the whole Guayaquil crop of red Cacao comes from one species, and this is the same that is found here and there planted in Bahia and Rio de Janeiro. In Esmeraldas (North Ecuador) there is at least one other variety, with short or nearly roundish fruits, but I have never succeeded in getting specimens. The beans are sold with those of the common one. The drawing of leaf and flowers and fruits in Treasury of Botany exactly represents the Ecuadorean or Guayaquil Cacao-tree (but the bean is oval).

7. The sample of "Machala" Cacao forwarded is so good in quality that it nearly comes up to "Arriba," which also proves that it originates from the same tree. Fine "Arriba" is nearly bright red. General "Machala" and inferior "Arriba" dark brown to very dark umber. (The beans are finally dried here on the streets or quays along the river).

The Cacao grows only successfully on certain stretches of the immense delta of the River Guayas and the more southern rivers. It requires an alluvial yellow loam as a subsoil, as far as I can see. Where grass will grow Cacao will not be a success. It is a forest tree from the moist (but not generally flooded) borders of great rivers under the tropics. The plantations on the Cacao estates are in larger or smaller patches.

The "Arriba" Cacao comes mostly from the province "Los Rios," Guayaquil being in the Province "Guayas," and Los Rios being the delta higher up, before the main river Guayas is formed.

Whether the original home of the Cacao-tree is the Amazon Valley or Ecuador, from Esmeraldas to the arid coast of Peru, is a question. There are two Cordilleras with "Paramos," or snow summits (Paramos=grass-grown and above tree-level, say 10,000 feet), and the temperate Andean valley separating the two districts; the Amazon delta has only been civilized in part in our days, and there is no great export from that side. I should say that Ecuador is the original home, and that the seeds have been carried across eastwards and thus into the Orinoco delta and on to Trinidad, etc.; Caracas being a centre, the one nearest to Guayaquil.

8. Altogether, when looking into these questions, it must be borne in mind that Peru of the botanists is the present Ecuador, and that the Spaniards, unlike the Portuguese Brazilians, never cared for anything but silver and gold, left botany quite alone, and neither knew nor adopted native names, and that in a land where every locality among the natives takes its name from a tree or plant, as Sigsigbamba (Sigsig=a flowering reed, if I remember rightly; Bamba=a plain).

9. Amongst the Cacao from Machala comes what is called "Cacao blanco" (*Theobroma bicolor*). It is very rare among the "Arriba." The seeds or beans are very similar and the pod somewhat similar, but the leaf is different. The cotyledons of "Cacao blanco" are white, and when fresh taste like an almond, and are very oily. These seeds are, as far as possible, picked out from the real Cacao seeds if intended for the general European market. There is an additional reason for this. Neither rats or other animals eat the Cacao bean, as far as I know, but rats are very eager to get at the "Cacao blanco" bean, and will destroy a sack to get at a single bean. But in Spain, and I suppose in Mexico, an oily chocolate, that is, with as much Cacao butter as possible, is considered the best. Therefore for the Spanish market an admixture of this so-called white Cacao (I do not believe that it ever is above 1 per cent.) is not objected to on account of the abundant oil in the bean. Whether the admixture of this spurious Cacao tree in the southern plantations is the result of negligence or ignorance, or whether it has been made to meet the Spanish taste, I have not as yet formed an opinion, but the "Arriba" plantations, where it is very rare, are modern. When Quito was first occupied by the Shirris, a coast tribe from Puna (the island in the Gulf of Guayas) perhaps, they got to Quito from Bahia (not the Brazilian de San Salvador), due west of Quito. De la Condamine in 1738 went also from Guayaquil up the coast, and, I believe, as far as I can understand it, got to Quito by the track from Esmeraldas, which he struck coming from Bahia. The present route *viâ* Los Rios (called *viâ* Bahahay) was made use of by his companions who had preceded him, but the delta must then hardly have been fit for cultivation of any sort.

Anyhow, the "Cacao blanco" cannot be indigenous to that present great centre for the cultivation of Cacao. As far as I know, the "Cacao blanco" is never shipped by itself. The workmen and employés eat most of them.

The Cacao comes to Guayaquil taken out of the pods and fermented and partly dried. This last is better done in Guayaquil,

which for months has no rain at all. As it comes down it is mixed with branched remnants of the arils. These are picked out and used for horse fodder ; they are very much relished by the horses and mules. These arils are one of the perquisites of the ganger for the men cleaning and sacking the Cacao.

Yours truly,
(Signed) J. V. SIGVALD MÜLLER

The Director,
Royal Gardens, Kew.

DCXLV.—IMPROVEMENT OF SUGAR-CANE BY CHEMICAL SELECTION.

In the *Kew Bulletin* for 1894 (pp. 86–96), 1897 (p. 318), and 1898 (pp. 331–334), account was given of the method pursued at Calumet Plantation, Louisiana, and subsequently in Queensland and Barbados, of improving the sugar-cane by chemical selection. This is based on the known variability of cultivated plants and the consequent possibility of enhancing any desired character by the continued selection of the plants in which that character is most marked.

As long ago as 1886 it had been pointed out in a letter to the Colonial Office from Kew that the saccharine contents of the sugar-cane could be improved by progressive selection quite independently of reproduction by seed.

Mr. Bovell's results at Barbados have attracted the attention of Dr. Kobus, the Director of the Sugar-cane Experiment Station in East Java. He has lately favoured us with the following interesting letter, which is printed for the information of those working on the subject :—

DIRECTOR, SUGAR-CANE EXPERIMENT STATION, EAST JAVA, to ROYAL GARDENS, KEW.

Pasoeroean, March 26, 1899.

DEAR SIR,

IN the "Report of the results obtained on the experimental fields at Dodd's Reformatory, 1897," I see that you suggested to Mr. Bovell to try the selection of sugar-cane by chemical analysis of the juice.

Nearly three years ago I proposed the same to the principals of the experimental station at Pasoeroean. As I myself was appointed Director in the same year, I commenced after my return from Europe in May, 1897, with the analysis of nearly 6,000 canes and cane-clumps, and found that the available sugar in canes of the same age varied by as much as 2 per cent. At the same time I showed that canes grown from the same cutting and of nearly the same age might show a difference in available sugar of from 7 to 8½ per cent. I concluded therefrom that it was not advisable to select individual canes, but that it was necessary to select cane-clumps. When the juice of a whole cane-clump, except the tops, has a great amount of available sugar

every cane of the clump must have it also, and the chance that its descendants are rich in sugar is greater than when some canes are very rich and others of the same clump are very poor, and the cuttings of these rich canes used for selection. After I had arrived at this conclusion, I analysed 5,000 cane-clumps belonging to five varieties, and selected 10 per cent of the highest and 10 per cent. of the lowest polarizing plants. I had the pleasure to send you the pamphlet No. 41 with the results of the analyses in October, 1897.

Since then I have reaped the canes grown from these cuttings, and found that the descendants of the rich canes contained $1\frac{1}{2}$ per cent. more available sugar than the descendants of the poor canes (average of 3,200 analyses). I was astonished to find that the rich canes' descendants were heavier than the descendants of the poor canes.

I continued the selection with canes from other varieties or other fields (5,700 analyses), and found as a general rule that the rich canes were the heaviest, and also that the heaviest canes were the richest in available sugar. I concluded from this that both a high content of available sugar and a heavy weight are inherited by the descendants.

The results of these investigations I had the pleasure to send you in August, 1898 (Pamphlet No. 3, Third Series). The sugar estates who pay the expenses of our experiment station have granted me £500 to continue the selection on a larger scale, and placed at my disposal a cane-field of about 30 acres. Herefrom I selected 30,000 kgs. rich canes and 10,000 kgs. poor canes for cuttings, and these showed again the same properties.

I mention these investigations which, perhaps, escaped your attention, as the pamphlets are written in Dutch. But you would find them worth making known to sugar growers in the West Indies.

I am, &c.,
(Signed) J. D. KOBUS.

The Director,
Royal Gardens, Kew.

DCXLVI.—A BUDGET FROM YUNNAN—continued.

The following letters are in continuation of those printed in the *Kew Bulletin* for 1898, pp. 289–297 :—

EXTRACT from letter from Dr. A. Henry, F.L.S., to Royal Gardens, Kew, dated Szemao, par Laokay, Tongking, November 29, 1898.

Collecting goes on apace ; and I think the Szemao collection will fully equal that of Mengtze, and it will be considerably different, wonderfully so when one considers that the two places are on the same parallel, at no great distance—200 miles say. The great bulk of the plants are different, *i.e.*, of individuals (of course, many species are common). Here the dry forests of *Quercus* (6–10 species), *Castanopsis* (3 spp.), *Schima Wallichii*, *Helicia*

(3 spp.), *Anneslea*, are quite strange to one coming from Mengtze. I have just found *Quercus lamellosa*, a splendid tree, with enormous beautiful acorns and very pretty foliage. The seeds of the *Castanopsis* are edible, fairly so, and I daresay if as much attention had been paid to them as to *Castanea*, some nice fruits would have been evolved. One has tiny little seeds, but a shake of the tree brings the seeds down in hundreds, and the small boys are provided with a mallet for this purpose. I came across a fine *Buddleia* the other day (of which you have specimens from Mengtze). It has very thick coriaceous leaves, covered with white down underneath ; and, growing as it does in masses on the highest parts of the mountains, it is very effective. The curious *Pyrus Delavayi* is very common here, and occurs also high up. It has large fruits, very like an apple, and fairly edible ; indeed, it is the best wild *Pyrus* I have tasted. The ovules are four in each cell, thus establishing a passage to the quince. Of these last two I must send seeds.

The prettiest shrubs just now are three species of *Desmodium*, which are new to me. The *Cyrtandreæ* are numerous, and quite distinct from those of Mengtze. Of one lovely little one, with orange flowers, I have obtained a lot of seed. The natural orders here are represented very peculiarly. I haven't seen a Crucifer ; and *Compositæ* will, I think, rank in number of species quite below many orders. One, a *Vernonia*, is a good-sized tree. *Ficus*, of course, is strongly represented, and in every kind of habit. One has the inflorescences borne on long branches which start from the root and lower part of the branch and stretch over the ground for 20, 30, or more feet. I haven't seen a rose, but, as usual, I have two or three very new-looking *Rubi*. *Ardisia* is very largely represented ; and, very curiously, all occur together, *i.e.*, all in ravines, and they flower very nearly at the same time ; so there does not seem to be any competition amongst them. They are very pretty in flower, and the fruits remain on for several months, red or black, as the case may be.

Just now the most noteworthy thing is the occurrence of so many kinds of white berries of a consistency like jelly. This is common in *Cyrtandreæ*, certain *Rubiaceæ*, and even the nutlets of some woody *Labiatæ* are of this curious appearance, not to speak of *Mæsa*, *Chloranthus*, &c. None of these occurred at Mengtze, so far as I saw, although, of course, some were collected for me in the more distant mountains. *Rhododendron* only two species, but very beautiful shrubs.

By a glance at the newly-described ferns you will see that quite a number came from Mi-Le, which is considerably north of Mengtze ; and I think the north-east of Yunnan and Kweichow will turn out astonishingly rich in new plants, and it is there rather than here in the south that new generic types will be found. My trip in the mountains north of Ichang showed the possibilities of Central China ; and the trip was, as it were, a mere scratch of an exploration. Hundreds of such trips can be made in Szechwan, Hupeh, Kweichow, and Shensi, and you may quote this opinion to people who wish to get out the seed-collecting expedition I advocated. In fact, until the great region north-east, as it were, of the Himalayas is explored, people

will have no idea of the richness of the world in beautiful plants. I look upon this region as the central point from which the Temperate Flora has originated, or has been broken up into numberless species.

I note what you say about fluviatile shrubs; but here I am quite confined to my office and cannot get away on trips, and so I am unable to make observations in quantity. I am also spending a lot of time at the study of the Lolo language, as I think it a pity to leave such an interesting field unexplored. I have completed a good-sized dictionary, and translated a number of booklets. There is much to be done here in the study of living plants, but, alas! I haven't the time. I am dependent, indeed, for the great richness of my collections in a large measure on the excellent native, old Ho, who is working for me here as he did at Mengtze. The handling of the collections, labelling, packing, keeping free from insects and mould takes up a good deal of time indeed. My Yunnan numbers now reach 3,700, *i.e.*, 1,200 new ones since the Mengtze collection. I scarcely find the immediate surroundings so interesting as Mengtze, as the forests are very uniform, and high mountains don't occur. I hope that the turn of the Service wheel may despatch me to Teng-Yueh when a Custom House is established there. A little more north there are higher mountains, and I think there would be quite a new flora there, judging from the way in which the flora changes as one goes westward from Kwangsi to Mengtze, and from Mengtze to Szemao. I am packing up with the Szemao set a number of plants sent me from Lungchow by Mr. Morse; but two packets of duplicates and other plants sent by him were destroyed by fire in the summer at Manhao; a very annoying accident. He found *Lysidice rhodostegia*, Hance, which is a wonderfully beautiful tree.

I hope you will succeed in growing San-ch'i. It should be tried in the shade; and transplanting will be of benefit, as this is done by the cultivators. This plant is mainly cultivated by the Yao aborigines who live in the mountains from Kwangsi east to near here. These people are a race sub-genus. The men are excellent sportsmen, and dress in a very neat Tyrolean sort of attire. They move about in the mountains from place to place, opening up new clearings in the forest, and are much addicted to little cultures, such as of indigo, San-ch'i, &c. Their language is unlike that of any of the other aborigines; and they merit a study.

I am too far north for Benzoin. You ought to write in connection with it to the Consul of Chiengmai, in Siam.

EXTRACT from letter from Dr. A. Henry, F.L.S., to Royal Gardens, Kew, dated Szemao, par Laokay, Tongking, December 20, 1898.

Collecting still goes on, and I have two boxes of Szemao plants ready for Kew. There will be quite a large number of plants hitherto supposed to be Indian only. I have just found *Clematis*

smilacifolia, which is a very grand plant indeed. There is coming into flower now in the shade of the woods an *Edgeworthia*, which, I think, is new, as the leaves are glabrous and are also persistent. Like most of the plants which grow in shade only, the flowers are white. As at Mengtze, this is the best season for plant collecting: the weather is beautifully dry, and there are almost as many plants in flower now as in the spring, *i.e.*, in the forests. In the dry, exposed hills the grass is withered brown, and there is some appearance of winter effects; but in the protection of the ravines there is, as it were, spring. The temperature this morning was 4° C. only.

You remarked in your last letter that the Ginseng plant did not succeed with you. You ought to try in the case of the San-ch'i the native method of culture, which is, sowing under low sheds over which leaves are spread as a roof, so that the plants only get a glimmering light. After the first year the plants are always transplanted, and still kept growing under the sheds just mentioned. In a similar way *Coptis Teeta* is cultivated. These plants cannot apparently bear any direct sunlight.

Some of Morse's Lungchow plants will go forward with my next lot. He found *Lysidice*, a remarkable Cæsalpiniacea, which must be a wondrously beautiful tree, also a species of *Aspidopterys*, a Malpighiaceous genus not hitherto recorded from China, etc. He is now at Pakhoi, and I hope to receive some plants from there from him.

I hope the revolving wheel of the Service may send me to Teng-Yueh when that place has a Custom House, as in that vicinity there are high mountains, and there would be a chance of rivalling Delavay's collections from the mountains near Tali. I am, of course, satisfied with Szemao, as it is really very interesting in many ways; but I cannot get away on trips, and my short excursions are limited to forests which are very uniform in character. And in a mountainous country one likes to have two or three distinct floras to work in.

My Lolo studies are going on. I have found out many curious things in their writings. The occurrence of Taboo is interesting, I think—in the way it occurs. Each surname, as a rule, signifies a tree or animal name, and the bearers of the surname can't touch in any way the tree or animal belonging to them. This tree or animal is, however, not considered sacred or an object of worship. Diseases are—nearly all—explained as the visitation of evil spirits, or the meeting with unlucky omens, though omen is not the word which expresses the thing exactly. This thing—an unlucky omen—*Slo-ta* in Lolo, is some uncanny occurrence. A cow, *e.g.*, getting on the roof of a house is sure to bring trouble in the way of illness; and the *slo-ta* here concerned must be averted by reading an appropriate ritual.

The Lolos have a rigid enough set of morals; but they are entirely devoid, I think, of the idea of *sin*. They are very severe on theft, and a man, *e.g.*, cutting down a tree which blocks the path is considered to do wrong, but a man getting drunk, that is not considered a wrong. In other words, they have the conception of wrongs, done by one person to another—infractions against

tribal rules, &c.—but of sin in the individual, hurting the individual himself, there is no trace, I think. Nor can I find any idea of sin as an offence against spirits or gods. There are good and bad spirits—but they all seem really to be obnoxious, *i.e.*, causing disease and calamity; and they are worshipped by sacrifice and ritual, or by sacrifice and exorcism (a more suitable term, perhaps).

Here the Buddhist doctrine of transmigration and a Hades has affected the Lolos; but one can see it is a late introduction and has no bearing on their lives. They have no idols; and their only priests are the Pê-mo or Exorcists, who are such in virtue of the fact that they can read the appropriate rituals, *i.e.*, Pê-mo = priest = exorcist = literatus. The priest and the scholar are not as yet differentiated. Witches, of course, occur. They have also an ordeal which is curious. It is also very difficult to account for their legends of the deluge, of Cyclopean men with one eye, &c.

DCXLVII.—MISCELLANEOUS NOTES.

Mr. Isaac Henry Burkill, M.A., late Temporary Assistant in the Herbarium of the Royal Gardens, has been appointed Principal Assistant in the Director's Office. Mr. Burkill was a scholar of Gonville and Caius College, Cambridge, and Assistant Curator of the University Herbarium. He received the Walsingham medal in 1894.

Mr. Henry Harold Welch Pearson has been appointed by the Secretary of State for India in Council, Assistant (for India) in the Herbarium of the Royal Gardens, in succession to Dr. Stapf, promoted to be a Principal Assistant. Mr. Pearson was Assistant Curator of the University Herbarium, Cambridge, Frank Smart Student, Gonville and Caius College, and, as Wort's Travelling Student, visited Ceylon in 1897.

Mr. Thomas William Brown, a member of the Gardening Staff of the Royal Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Acting Curator of the Botanic Station at Aburi, Gold Coast, during the absence on leave of the Curator, Mr. W. H. Johnson.

Mr. J. R. Wigman, son of the Curator of the Botanic Gardens, Buitenzorg, Java, entered Kew for a course of training in 1894–5, and has been appointed Curator of the Botanic Gardens, Paramaribo, in Dutch Guiana. He writes:—"I am forming the garden on the site of an abandoned sugar plantation, half an

hour's walk from Paramaribo. It is almost overgrown again with forest, and it lies so low that it gets flooded during the rains. I am at present occupied in clearing and draining, making roads of the felled trees, and opening ditches to carry off the water. Along the roads I am planting *Cassia florida*, *Peltophorum arboreum*, *Albizzia moluccana*, and *Eucalyptus alba*."

Botanical Magazine for February.—*Gentiana Burseri* is a robust species with dull yellow flowers marked with small black spots. It is a native of the Pyrenees and Western Alps, and is closely allied to *G. punctata*. The specimen figured was sent to Kew by the Rev. Canon C. J. Parker, of Upton Cheyney, Bristol. *Elæagnus macrophylla*, native of Japan and Formosa, is noteworthy chiefly on account of its bright rose-red fruits, which mature in May. The drawing was made from a specimen received from Messrs. Veitch's Coombe Wood Nurseries. The pretty Burmese *Dendrobium capillipes* was sent to Kew more than a quarter of a century ago by the late Rev. C. Parish. *Ceanothus integerrimus*, from California, is an ornamental shrub with small white or pale-blue flowers crowded together in a large terminal panicle. The species has been in cultivation at Kew for many years. *Epilobium obcordatum*, also from California, is a beautiful plant for the rock-garden. It grows about 8 inches high and bears rather large, bright rose-coloured flowers, in the axils of the upper leaves. A living plant was sent to Kew by H. Selfe Leonard, Esq., of Hitherbury, Guildford, in 1894.

Botanical Magazine for March.—*Dryandra calophylla* is a dwarf shrubby plant, resembling some of the species of *Banksia*, to which genus *Dryandra* is closely related. All the species of *Dryandra* are endemic to Western Australia, the one figured being from King George's Sound, whence seeds were obtained by Messrs. Veitch, of Chelsea, who communicated them to Kew in 1893. *Passiflora pruinosa* is a handsome new species from British Guiana. The plant which furnished the specimen drawn was raised from seed received from Everard F. im Thurn, Esq., C.M.G., in 1897. *Kniphofia Tuckii* is a distinct species from Cape Colony, whence it was introduced into cultivation by Mr. Max Leichtlin, of Baden-Baden. The Kew plant was obtained from the Cambridge Botanic Garden in 1897, and flowered for the first time in the Temperate House in April, 1898. *Gynopleura humilis* is an interesting annual belonging to the Passifloraceæ. Seeds were sent to Kew from the Botanic Gardens of Santiago, in Chili, of which country the species is a native. *Rosa acicularis*, var. *nipponensis*, has solitary flowers with long narrow calyx lobes, which eventually converge and surmount the mature fruit, and deep rose-coloured petals. The variety differs from the type in having glandular prickles on the young branches and peduncles. Seeds were received from the Botanic Garden, Copenhagen, in 1894, from which the plant figured was raised.

Karoo plants.—Visitors to No. VII. House at Kew, which is mainly devoted to South African species, will have noticed a collection of plants of the most singular aspect. Nature seems to have aimed, and with entire success, at obtaining the maximum of bulk with the minimum of surface from which water could be lost. They are natives of the Karoo, the singular district which forms "a vast shallow basin" from 1,800 to 2,500 feet, north of the Zwarteberg. Kew is indebted for them to the unceasing generosity of its old correspondent, Professor MacOwan, F.L.S., the Government Botanist of Cape Colony. The following interesting letter relates to some recent contributions of peculiar interest :—

PROFESSOR MACOWAN to ROYAL GARDENS, KEW.

Matjesfontein,
MY DEAR FRIEND, October 5, 1898.

BY way of rustication, I find myself for a few days here in the Karoo, a dry and thirsty land where no water is, unless you pump it up from the bowels of the earth. There has, therefore, been opportunity to find for you the *Crassula pyramidalis*, for which you were sighing in a not very ancient letter. Being taken up in a very dry time, and after the flowering season, there is all the better chance of the specimens sent reaching you in condition. I have found in practice at the Botanic Garden that every plant which we succeeded in flowering invariably died off after that piece of physiologic work. Hence it will be well to give your trouble to the smaller specimens, and not to bother about the few sent with the dry flower-heads still adhering to the stem apex. With these are a good many of the common and uncommon objects of the Karoo : two species of *Pelargonium* of the humpty-dumpty sort, and another, not previously seen by me, with a string of succulent stem-joints, large white stipules and pale creamy yellowish-white flowers—a pretty little thing.

Euphorbia Hystrix is here—a very comical plant. When the tufts are elliptical in shape it looks exactly like a great green hedge-hog, more like that evil beast than like the legitimate yzer-vark, "iron-pig," or porcupine, after which it gets its specific name. There seems to be an underground common stem, or caudex, from which, by copious branching, all these closely huddled ramuli take their rise. The plant I gathered among the rocks above Wapperthal for *E. Hystrix* differed from this, in that the caudex was distinctly above ground. Perhaps it may be another species, but if it were buried three-quarters under ground it would present exactly the above hedge-hog aspect. I have some 25 ramuli of the Matjesfontein one, ready for exsiccation when I return to town. The *Arthrothamnus* section of *Euphorbia* should be cultivated so as to have them properly described, when? when you get to them. They cannot be described from exsiccata. Moreover, the Ecklon and Zeyher exsiccata of *Euphorbia* that I have are too bad for words. I send one common species, which I got out, in such condition that I think it may survive the travel home. Some others, great fleshy fellows, are far too big for sending in this little parcel way. The worst of it is, they alter incredibly in aspect when cultivated in the damper atmosphere

of Cape Town. A plant with thick corpulent fleshy ramuli will, in culture, make a perfect fool of itself on starting growth after a year's stay in Cape Town, and, instead of keeping to the old chubby pattern, slims off, which is distinctly unfair to the adoptive horticultural father who has maintained him. Some figures of *E. Caput-Medusæ* in English works, and elsewhere, are vitiated thus; they make us Capensians laugh.

I hope you will be able to read this. It is written with an aged pen, which seems to have seen years of service in the Karoo, and ink made seemingly of equal parts of black lead and sour beer.

Now I must give over; the pen is restive.

Faithfully,
(Signed) P. MacOwan.

Medallion of Sir Joseph Hooker.—An addition to the large collection of portraits of eminent botanists and travellers has recently been made by the kind consideration of the President and Council of the Linnean Society of London, who have presented a framed cast in bronze of the original model of Sir Joseph Hooker, G.C.S.I., C.B., P.-P.R.S., executed by Mr. Frank Bowcher. It is an excellent portrait of Sir Joseph at the age of 80, and records the completion of the "Flora of British India" and of a period of sixty years service to science. It has been placed in the Museum.

A gold medal, specially struck for the occasion for which the medallion was designed, was presented to Sir Joseph Hooker at the Anniversary Meeting of the Linnean Society on May 24, 1898.

"Congo Sticks."—We are indebted to Messrs. Henry Howell and Co., of 180, Old Street, for a further contribution to the series of umbrella sticks and walking canes which have from time to time been presented by them to the Museums of the Royal Gardens. The specimens now received are the rough and finished sticks known in the trade as Congo sticks. The word "Congo" is a purely commercial name, the sticks being saplings of the Chestnut (*Castanea sativa*), which apparently offers advantages over other woods for manipulation while growing. The characteristic knots or markings for which the so-called Congo sticks are valued are produced by lacerating the bark through to the wood while growing. They were formerly obtained from the north of France, but are now almost exclusively produced in Austria-Hungary, the precise district being near Carlstadt, in Croatia.

Karité Tree.—Messrs. James Irvine and Co. wrote from Liverpool, 25th August, 1897:—

"Some months ago I wrote to you about a bean which Felix Dubois referred to in his book on 'Timbuctoo,' and you then stated your conviction that it was the Shea Butter (*Butyrospermum Parkii*, Kotschy).

The account of it in Dubois' book whetted my appetite, as its description met a want which I knew to exist in a particular branch of business, and I wrote to him to the care of his publisher, and yesterday I received a most interesting letter from him from the Niger. A copy of it, as far as it refers to the Karité bean, I send for your information ; I daresay the whole of it is already known to you, but it may not be, and, in any event, will be interesting."

[Enclosure.]

COPY of letter from M. Felix Dubois to Mr. James Irvine, dated Dienne, July 2nd, 1897.

My publisher forwarded your letter of May 10th, which reaches me here while on a fresh journey in the Niger country.

It is with the greatest pleasure that I send you some information respecting the Karité tree. I can do so better from here than elsewhere. At this moment the Karité nuts are ripe—they resemble small green apples. The green skin is very agreeable to eat ; unfortunately on each fruit there is only a very small quantity—the natives like it very much. Under this skin is a large nut, in size and appearance like the Indian Chestnut (*Æsculus indica*, Colebr.), with a thin light brown covering, and inside a white nut.

It is this white nut which gives the Karité butter. It smells, in fact just like chocolate. To our European scent it is even nasty. In fact, this fruit is not really known in Europe, but only the very slightly scented butter which is produced from it.

On the other hand, the travellers (Mungo Park and Lander) who were the first to notice it, probably were never present at the process of making the Karité butter, but contented themselves with the natives' account of the manufacture. Otherwise, certainly that smell of chocolate would have struck them. In order to be rid of that smell the nut must be taken out of the skin and dried. When the dried nut is put in boiling water the smell of the chocolate leaves it, and the liquid takes the colour of chocolate. Also, I am told that certain of our officers in the Soudan have the nut roasted and ground, and then use it as chocolate.

(Signed) FELIX DUBOIS.

Dr. Schweinfurth, in "*The Heart of Africa*" (Vol. 1, p. 220) refers in the following words to this useful tree, he says :—"The fruit is as large as a good sized apricot, and is enveloped in a green rind. This envelope can be kept till it is as enjoyable as a Medlar, and is considered one of the chief fruits of the country. From the kernels of this widely known tree an oil is expressed, which, under the name of 'butter of Galam,' is a recognised article of commerce in Gambia ; it has an unpleasant flavour which makes it not at all a desirable adjunct to the table, and so, for us, it has but an insignificant value. Its most valuable property is, that at a temperature of 68° Fahr. it becomes as solid as tallow.

"The tree itself is very handsome, having a bark which is regularly marked by polygonal rifts in its surface, and which permits it to be likened to an oak."

A full account of what was known at the time of the Shea Butter Tree, together with details gathered from Mungo Park's Travels will be found in the *Pharmaceutical Journal* (Vol. IX. [ser. 3], 1879, p. 818).

In Museum No. 1, case 69, are specimens fully illustrating the industrial applications of this tree, together with examples of the seeds as they appear in commerce. It may be well to mention that the Herbarium of the Royal Gardens contains a specimen of a variety collected at Borgu, by Mr. Barter, which is small-leaved, and flowers three weeks before the ordinary tree.

Stapelia gigantea, *N. E. Brown*. Recent discoveries point to the fact that in size and distribution this plant is the most remarkable of the whole tribe of Stapelieæ. Not only has it very much larger flowers, but its geographical range is vastly more extensive than any other known species, as the plants of this tribe are notably somewhat local or restricted in their distribution. *S. gigantea* was originally discovered by Mr. R. W. Plant, whilst collecting in Zululand, and at his death a living plant was brought, with the rest of his belongings, by his Caffir servants to Durban, Natal, where it is recorded as having flowered in 1860; and a portion of that plant was brought alive to England by Mr. T. Cooper, in 1862. It was next collected by Gerrard, in 1861, near the Umvelosi River, in Zululand. Since then it has also been found on the Magaliesberg Range, and near the Nylstroom River, in the Transvaal. In 1887 a specimen and a living plant were sent to Kew by Professor MacOwan, collected at Walfisch Bay, in Great Namaqualand, quite the other side of the Continent. And, lastly, specimens were sent to Kew, in 1897, from British Central Africa, by Mr. Kenneth J. Cameron, who states that it is "found growing wild at Namasi," in Nyasaland. This species has a range, therefore, through about thirteen degrees of latitude and seventeen degrees of longitude, being found within and without the tropic, and on both sides of the Continent of Africa.

N. E. Brown.

Serenoa serrulata as a remedy.—The following letter draws attention to the therapeutical value of the seeds of the "Saw Palmetto," which is abundant in the sandy soils of the Southern United States. A previous and more detailed account will be found in the *Planters' Gazette* (May 31st, 1879, p. 123). A tanning extract is obtained from the leaf-stalks; see *Pharmaceutical Journal*, July 6th, 1895, p. 4.

Professor C. S. Sargent to Royal Gardens, Kew.

Arnold Arboretum, Harvard University,
Jamaica Plain, Mass., February 4th, 1899.

My Dear Dyer,

We are sending you by express a small box containing various seeds and a supply of fruit of *Serenoa serrulata* for the Economic Museum. This fruit is now very largely used in this country in

the preparation of fluid extracts, about two hundred and fifty tons being consumed annually in this way. Its medical values are highly prized for the treatment of all diseases of the mucous membrane, and especially for the alleviation of troubles of the prostate gland.

Faithfully yours,
(Signed) C. S. SARGENT.

Sir William Thiselton-Dyer, K.C.M.G.,
Royal Gardens, Kew.

Chinese Medicinal Fungus. — The following communication relates to a fungus, apparently new to science, no account of which, or of its supposed virtues, appears to exist in the literature of Chinese medicinal plants.

It will be described as *Paxillus Osteopæon*, Mass.

MRS. E. L. KEMP TO ROYAL GARDENS, KEW.

Beechwood, Rochdale,
August 27th, 1897.

SIR,

I MUST apologise for troubling you, but my daughter has sent home the enclosed Mongolian mushrooms from China, and is anxious to know, if possible, what species they are. They are largely used there as medicine for diseases of the bone, and with good results. If you can give me any information about them I shall feel very much obliged.

Yours faithfully,
(Signed) EMILY L. KEMP.
